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Description

COLLAPSIBLE MATTRESS BORDER CONSTRUCTION AND METHOD

BACKGROUND OF THE TECHNOLOGY

[0001] Field of Technology

[0002] The invention relates to a mattress border construction formed of pre-assembled components. More specifically, the invention relates to a collapsible border construction for better packing and shipping efficiency when collapsed and for quicker assembly of a mattress core expanded.

[0003] Description of the Related Technology

[0004] Companies have searched for the perfect combination of mattress components that result in a quality night's sleep. Typically, sleeping mattresses are formed with a mattress central portion or mattress core surrounded by a mattress border construction. The mattress central portion may comprise a series of coil springs connected together and encased in a quilted fabric or casing. Alternatively, the

mattress central portion may comprise polyurethane or latex foam layers or synthetic or natural fibers, optionally in combination with springs, and encased in quilted fabric. The central portion might also constitute an air mattress or water mattress or other body-supporting mattress structure.

[0005] Mattress border constructions stabilize the edge or border portion of the mattress. These borders are more firm or rigid than the mattress central portion and prevent the mattress from buckling when a person sits on the mattress edge. Generally, the company that manufactures the borders is not the same company that manufactures or assembles the mattress. Therefore, the borders usually are shipped to a mattress manufacturer for final attachment to the mattress center portion, whereby the attachment is usually done manually using various methods.

[0006] Mattress border constructions of various types have been disclosed in the prior art. U.S. Pat. No. 5,537,699 of Bonaddio et. al. discloses a mattress border construction formed with a foam rail sleeve surrounding a plurality of springs arranged in a row. The foam rail sleeve defines a core into which a row of coil springs is inserted. The foam is slit on the side wall to facilitate insertion of the row of

springs and then sealed with an adhesive. Several of these foam rail sleeves surround a mattress center portion, thereby forming a periphery, and are attached to the mattress center portion with adhesive. It has been found, however, that the adhesive can be difficult to apply, and can create more need for substantial clean up of applicators and surrounding surfaces. Furthermore, liquid adhesives and hot melt adhesives cannot be pre-applied before the mattress border construction is delivered to the mattress manufacturer.

[0007] U.S. Pat. No. 5,701,623 of May shows a composite mattress topper surrounded by border sections of latex foam. The border sections have square ends or alternatively angled ends similar to a picture frame. The border sections are attached to the core section with an adhesive that cannot be pre-applied before the border sections are shipped. Thus, this technology does not reduce the overall cost of assembly.

[0008] To avoid the use of liquid adhesives, U.S. Pub. No. US 2003/0000021 A1 shows a mattress border assembly containing double-sided high strength adhesive tape attached to portions of the foam rails. The double-sided adhesive tape contains a release layer on one side to pre-

vent premature adhesion during packing and shipping. This technology allows the mattress manufacturer to attach the border sections to one another and to the mattress core without the use of messy liquid adhesives. Furthermore, multiple foam rails may be stacked one atop another in a standard shipping container, and assembled on site at the mattress manufacturer. Shipping multiple borders in an unassembled state is cheaper than shipping a series of assembled borders.

[0009] Another technology that avoids the use of liquid adhesives is disclosed in U.S. Pat. No. 4,970,743 of Wride et. al. The mattress border consists of foam perimeter sections that have an interlocking design with a tongue and groove type arrangement, where the tongue and groove extends the entire length of the perimeter sections. Securing means, such as tape or hook and loop fasteners, are stretched across the tongue and groove joints to provide extra support. Furthermore, the patent discloses the use of extra support tapes to prevent bowing of the sidewalls upon application of transverse pressure.

[0010] A consequence of the pre-applied adhesive coated rails is the need to manually attach each rail to the mattress core, thus, not significantly reducing the assembly cost. The

same drawback is noticed with the interlocking rails because each rail must be manually inserted into the adjoining rail then the entire assembly reinforced with tape. To overcome this manual assembly step, some manufacturers use a unitary border assembly as seen in U.S. Pat. No. 5,259,079 of Visser et. al., which shows the use of a tray to hold the mattress core. The tray can accommodate both a liquid filled and non-liquid filled mattress core either separately or in combination. During mattress assembly, the manufacturer places the desired mattress core or mattress core combination inside the tray without the use of adhesives.

[0011] Similarly, U.S. Pat. No. 4,389,743 of Callaway shows the use of a one piece rigid outer perimeter border with an opening at one end. The opening allows the mattress manufacturer to easily insert a mattress core in a "cassette-like" manner. The outer end of the mattress core contains the remaining end of the perimeter border. Both these technologies allow for easy assembly in the mattress manufacturing plant, thus, reducing the overall assembly cost. The draw back, however, is that these technologies are costly to ship to the mattress manufacturers because of the large dead volume provided by the center

opening or tray. This dead volume requires that the packer use a container with an interior volume much large than the volume of several stacked mattress borders, which increases packing and shipping costs.

[0012] Summary of the Invention

[0013] None of the described mattress border assemblies have the desired characteristics of easy assembly and compact design for increased packing and shipping efficiency. What is needed, therefore, is a mattress border assembly that collapses into a compact shape for efficient packing and shipping and easily expands into a unitary border assembly for a mattress construction.

[0014] The present border assembly overcomes this problem by providing a series of foam rails that are connected to one another in a manner that allows each foam rail to pivot away from its adjacent rail. The configuration allows (1) the packer to efficiently collapse the border assembly into a shipment-ready size, and (2) the assembler to easily expand the border assembly into a unitary perimeter frame for attachment to a mattress core.

[0015] In a first aspect, a collapsible border assembly according to the invention has two foam side rails and two foam end rails. Preferably, each foam rail has a generally flat or

square end wall and an angled or mitered end wall, where the miter preferably is at about 30 to 60 degrees, most preferably about 45 degrees. Upon assembly, the mitered end walls of the two side rails abut the mitered end walls of the two end rails, and the square end walls of the two side rails abut inner side walls of the two end rails. After assembly, the mitered end walls form a mitered corner joint and the square end walls form a substantially square joint, whereby the mitered corner joints are oppositely opposed from one another when the mattress border is expanded. Each foam rail has an outer side wall and an inner side wall for receiving hinges that connect the four rails together. The hinges are located on the outer side walls of the mitered joints and on the inner side walls at the square joints, so that the side and end rails pivot at the hinges on vertical axes defined by the hinges, where such axes are perpendicular to the angle of rotation of the side and end rails during collapsing and expanding of the border assembly.

[0016] Once assembled, the border assembly forms a perimeter frame defining a center opening to accommodate the mattress core, such as a spring support mattress, an air mattress, a water mattress or a foam mattress, or any

combination. During packing, the border assembly may be collapsed upon itself to a compact size for shipment by pivoting the mitered end walls of the side rails and end rails away from each other, and opening the hinges associated with such mitered end walls. In the collapsed position, the mitered end walls are separated by about 90 degrees, and the planar or square end walls are substantially released from the inner side walls, thus closing the center opening. Once collapsed, the side rails are in substantial contact with the end rails, with one side rail and one end rail aligned end to end, and the other end rail and the other side rail aligned end to end, and with each pair of side/end rails substantially parallel to one another. The packer may then stack several collapsed border assemblies into a shipping container that has substantially the same interior volume as the stack, thus, increasing packing and shipping efficiency and reducing the overall mattress assembly cost.

[0017] Preferably, the hinge comprises a material that has a flexible center portion that runs the vertical length of the hinge. More preferably, the hinge comprises an adhesive tape, and most preferably an acrylic adhesive tape. Alternatively, the hinge comprises plastic or other rigid mate-

rial that has a flexible center portion that runs the vertical length of the hinge. Such alternative hinges can be attached to the rails using conventional adhesives. In yet another embodiment, a hinge may be formed by cutting one block of rail material to form the mitered portion between an end rail and a side rail, where the cut is made so as to leave a portion of the rail material uncut thus pivotably joining the newly formed end and side rail together at such uncut portion, thus forming the hinge.

[0018] In an alternate aspect of the invention, the collapsible border assembly surrounds a mattress core to form a mattress. Here, the border assembly is expanded to form the perimeter frame with a center opening for receiving the mattress core. The mattress core is then inserted into the opening, whereby the mattress border substantially surrounds the outer edges of the mattress core. Furthermore, a first foam cover sheet or topper assembly can be adhered to a top wall of both the side and end rails and a second foam cover sheet or topper assembly can be adhered to a bottom wall of the both the side and end rails. This forms a mattress construction which can then be covered by fabric or a suitable alternative casing.

[0019] A further aspect of the invention is a method of preparing

a collapsible mattress border assembly for shipment prior to assembly into a mattress construction. With such method, one end wall of each of a first and second foam side rail is mitered to about 30 to about 60 degrees, preferably about 45 degrees. The same miter is cut into one end wall of each of a first and second end rail. When the mattress border is ready to be assembled, the mitered end wall of the first foam side rail abuts the mitered end wall of the first foam end rail to form a mitered corner joint. A hinge is then attached to an outer side wall of both the first foam side and end rail, substantially covering the mitered corner joint. The hinge can be any device having a flexible vertical center portion that allows the two mitered end walls to pivot away from each other, more preferably rigid plastic, and most preferably adhesive tape.

[0020] The second end wall of the first side rail abuts a portion of an inner side wall of the first end rail to form a substantially square joint. A hinge is then attached to an inner side wall of both the second foam side rail and the first foam end rail, substantially covering the square joint. The mitered end wall of the second end rail then abuts the mitered end wall of the second side rail to form a mitered

corner joint. A hinge is then attached to an outer side wall of both the second foam side and end rail, substantially covering the mitered corner joint. At this stage, the second end wall of the first side rail then abuts a portion of an inner side wall of the second end rail, thereby forming a substantially square joint and the collapsible border assembly. A hinge can then be attached to an inner side wall of the first side rail and an inner wall of the second end rail, substantially covering the square joint.

[0021] Other aspects and advantages will be apparent from the following description given hereinafter referring to the attached drawings.

DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a perspective view of a collapsed border assembly showing the mitered corner joints and square joints and the hinges covering said joints;

[0023] FIG. 2 is a cross-sectional view in front elevation taken along line 2-2 of FIG. 1;

[0024] FIG. 3 is a top plan view showing multiple collapsible border assemblies packed in a shipping carton;

[0025] FIG. 4 is an end cross sectional view in elevation taken along line 4-4 of FIG. 3, showing multiple collapsible border assemblies packed in a shipping carton;

[0026] FIG. 5 is an exploded perspective view of a border assembly expanded to form a perimeter frame with a center opening for receiving a mattress core;

[0027] FIG. 6 is a top plan view of an expanded mattress border assembly according to the invention;

[0028] FIG. 7 is a right side elevational view of the expanded mattress border assembly of FIG. 6;

[0029] FIG. 8. is an exploded perspective view of a mattress incorporating a mattress border assembly and topper assemblies;

[0030] FIG. 9 is a top plan view of the mattress of FIG. 8, partially broken away to show the mitered corner and square joints and hinges covering said joints in the mattress border assembly; and

[0031] FIG. 10 is a right side elevational view of the mattress of FIG. 9.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0032] Referring first to FIGs. 1 and 2, a border assembly 10 in the collapsed position has side rails 12, 12' and end rails 14, 14' both formed of a resilient material such as, but not limited to, polyurethane foam. Examples of polyurethane foams that could be used for the rails have densities in the range of about 1.0 to about 2.5 pounds per cubic foot

(pcf), and firmnesses from about 40 to about 125 ILD_{25} (indentation load deflection or sometimes also called IFD_{25} – see ASTM 3574). Other resilient materials besides polyurethane foam may be used.

[0033] Side rails 12, 12' and end rails 14, 14' have top walls 20, bottom walls 22, end walls 24, mitered end walls 28, inner side walls 30, and outer side walls 32. The side rails 12, 12' and end rails 14, 14' may be comprised of polyurethane foam surrounding springs or other firming central mattress structure, such as shown in U.S. Pat. No. 5,537,699 of Bonaddio et. al., or latex core, or fiber core, or water or air mattress, or a combination. In the embodiment shown in FIGs. 1 and 2, hinges 34 are applied to each joint formed by the abutment of the mitered end walls 28 of the side rails 12, 12' to the mitered end walls 28 of the end rails 14, 14', and the abutment of the square end walls 24 of the side rails 12, 12' to a portion of the inner side walls 30 of the end rails 14, 14'. The abutment of the mitered end walls 28 forms mitered corner joints 36, and the abutment of the square end walls 24 forms substantially square joints 37, whereby the mitered corner joints 36 are oppositely opposed from one another when the mattress border 10 is expanded to an open position.

[0034] The hinges 34 can be made of a material with a flexible center portion that runs the vertical length of the hinge, more preferably rigid plastic with a vertical flexible center portion. Most preferably, the hinges are formed from adhesive tape. Examples of suitable tapes may have a woven or non-woven construction, such as DUON® or TYPAR®, and can range from 1.0 to 3.0 oz./square yard. A rigid plastic hinge can be attached using conventional adhesive means such as glue or double sided adhesive tape. Furthermore, a rigid plastic hinge provides the border assembly 10 with extra torsional stability.

[0035] The hinges 34 are located on the outer side walls 32 of the mitered end walls 28 and on the inner side walls 30 of the square end walls 24. The vertical flexible center portion substantially covers the mitered corner joints 36 and square joints 37. The hinges 34 allow the side rails 12, 12' and end rails 14, 14' to pivot on a vertical axis that is perpendicular to the angle of rotation during collapsing and expanding of the border assembly 10. FIG. 2 shows hinge 34 in a collapsed position attached to the inner side walls 30.

[0036] In the collapsed position (FIGs. 1 and 2), the border assembly 10 is very compact, which is ideal for packing and

shipping efficiency. Here, the mitered end walls 28 are separated by about a 90 degree angle, and the square end walls 24 of the side rails 12, 12' are substantially released from the inner side walls 30 of the end rails 14, 14'. Hinges 36 are in a substantially open position, and hinges 37 are closed or bent by about 180°. Furthermore, once collapsed, the side rails 12, 12' are in substantial contact with the end rails 14, 14'.

[0037] As shown in FIGs. 3 and 4, multiple collapsible border assemblies 10 may be packed side by side and vertically stacked into a shipping carton 38. The interior volume of the carton 38 is substantially the same as the volume of the stack of border assemblies, thus reducing packing and shipping costs. Alternatively, multiple collapsible border assemblies may be stacked together in collapsed configuration to form a bundle that is then wrapped with a shrink wrap, a polyethylene sheet or other sheet-like wrapping material (not shown) for shipment with or without use of a shipping carton.

[0038] As shown in FIGs. 5 to 7, a mattress border assembly 10 in the expanded or open position comprises a perimeter frame-like structure formed from two side rails 12, 12' pivotably attached to two end rails 14, 14'. The hinge 34

attached to the side rails 12, 12' to the end rails 14, 14' allows the two sets of rails to pivot on a vertical axis where the angle of rotation is perpendicular to the vertical axis. The expanded frame 10 forms a perimeter defining a center opening 38 for receiving a mattress core 42. The mattress core 42 can be inserted into the center opening 38 using conventional methods. FIG. 6 shows a mattress 60 with a mattress core 42 surrounded by the border assembly 10 according to another embodiment of the invention.

[0039] FIG. 8 illustrates a further embodiment of a mattress 62 wherein a mattress core 42 is surrounded by a mattress border assembly 10 and covered by a top foam cover sheet 50 and a bottom foam cover sheet 54. The top foam cover sheet 50, which may also be a topper assembly, may be adhered to the top walls 20 of the side rails 12, 12' and end rails 14, 14' using an adhesive, such as a spray adhesive, a hot melt adhesive or double sided adhesive tape. Adhesives may be, for example, spray adhesives, such as Simalfa #3091-250Y, or hot melt adhesives, such as Industrial Adhesives #90-747C. An example of a suitable double-sided tape is 3M #9695.

[0040] Similarly, the bottom cover sheet 54, which may also be a topper assembly, may be adhered to the bottom walls 22

of the side rails 12, 12' and end rails 14, 14' using an adhesive, such as a hot melt adhesive or double sided adhesive tape. The mattress assembly 62 so formed comprises a mattress border assembly 10 encasing a mattress core 42 as shown in FIGs. 9 and 10. The mattress construction can then be completed in the customary fashion, by encasing the assembly in a fabric or quilting or ticking or casing to form the completed mattress.

[0041] In yet another embodiment, strips of double sided adhesive tape may be applied to the top walls 20 and bottom walls 22 of both the side rails 12, 12' and bottom rails 14, 14'. The exposed surface of the adhesive tape is covered with a removable protective liner to prevent premature adhesion during packing and shipping. The adhesive tape allows for efficient attachment of the top foam sheet 50 or topper assembly and bottom foam sheet 54 or topper assembly. The tape should have a bonding strength in the range of 5 to 15 psi, preferably 10 psi. The tape preferably is coated with an acrylic adhesive to a coating weight in the range of 30 to 34 grains per 24 square inches, preferably 32 grains per 24 square inches. The bond must tack and set quickly, reaching about 90% of its full bonding capability within about 10 minutes of adhering parts

together with the tape, and preferably reaches full bonding capability within about 15 minutes.

[0042] Numerous characteristics and advantages have been set forth in the foregoing description, together with detail of structure and function. The novel features are pointed out in the appended claims. The disclosure, however, is illustrative only, and changes may be made in detail, especially in matters of size, shape, and arrangement of parts, within the principle of the invention, to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed. Therefore, the invention must be measured by the claims and not by the description of the examples or the preferred embodiments.